Ground Motion in Mexico City During M 7.1 Earthquake of September 19, 2017

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Ground Accelerations at UNAM Station in Mexico City (116 km from Epicenter)

- **East**: 0.0547 g, 28 s, 6 Cycles
- **Up**: 0.0274 g, 50 s, 10 Cycles
- **North**: 0.0457 g, 43 s, 6 Cycles

Time, t (s)

[Graph showing seismic activity with time vs. acceleration for different directions]
Resultant Horizontal Ground Accelerations at UNAM Station in Mexico City

PGA = 0.0553 g
Ground Velocities at UNAM Station in Mexico City (116 km from Epicenter)

- East: 3.74 in/s, 4 Cycles
- Up: 1.42 in/s, 7 Cycles
- North: 3.51 in/s, 3 Cycles
Resultant Horizontal Ground Velocities at UNAM Station in Mexico City

PGV = 4.17 in/s
Ground Displacements at UNAM Station in Mexico City (116 km from Epicenter)

- East: 1.94 in
- Up: 0.793 in
- North: 1.59 in

Time, t (s)
Resultant Horizontal Ground Displacements at UNAM Station in Mexico City

PGD = 2.17 in
Central-Period & Normalized-Velocity

- Central-period,
  \[ T_c = 2\pi \left( \frac{PGD}{PGA} \right)^{0.5} = 2 \text{ s} \]
  Hence, \textbf{low-frequency} ground motion

- Normalized-velocity,
  \[ PGV_n = \frac{PGV}{(PGD \cdot PGA)^{0.5}} = 0.61 \]
  Hence, \textbf{medium-band} ground motion
Tripartite Plot of 5\% Damping Response Spectrum at UNAM Station in Mexico City
Acceleration-Deformation Plot of 5% Damping Response Spectrum
Envelope Response Spectra for Various Values of Damping

![Graph showing peak pseudo-acceleration vs. peak deformation for different values of damping](image_url)
## Deformation Demands on Structures of Various Lateral Strength and Damping

<table>
<thead>
<tr>
<th>Lateral Strength (% of Weight)</th>
<th>Deformation Demand (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5%</td>
</tr>
<tr>
<td>18%</td>
<td>0.5</td>
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<tr>
<td>15%</td>
<td>3.6</td>
</tr>
<tr>
<td>10%</td>
<td>4</td>
</tr>
<tr>
<td>8%</td>
<td>4</td>
</tr>
<tr>
<td>6%</td>
<td>4</td>
</tr>
<tr>
<td>4%</td>
<td>4</td>
</tr>
</tbody>
</table>
Observations and Comments

• Ground motion at UNAM station in Mexico City was low-frequency and medium-band

• Deformation demands were low on even weak structures

• Cyclic-demands were modest

• Such ground motions are not expected to collapse ‘engineered’ structures in seismically active regions
Acknowledgments

• Data may be downloaded from the Center for Engineering Strong Motion Data: http://www.strongmotioncenter.org/

• Data processing, observations and comments are preliminary

• No warranty of any kind is assumed